
Appendix I:

Facility Design Guidelines:

The purpose of the Facility Design Guidelines is to assist public and private sector agencies, organizations and individuals in developing greenway facilities that are in keeping with the overall Greenway Program goals and objectives. Every effort shall be made to preserve and protect the natural, cultural and historic resources found within all Greenway corridors. These Guidelines provide a variety of trail facility and ecological system restoration concepts and ideas.

The Guidelines are not a substitute for a more thorough examination and detailed landscape architectural and engineering evaluation of specific facility projects. LFUCG disclaims any liability for the use, appropriateness and accuracy of these Guidelines as they apply to a specific project; the Guidelines are intended to be used as a generalized guide towards establishing minimum standards for greenway facility development. It is recommended that explicit Design Guidelines be developed in a new Greenway Manual that will be used for the development of all Greenway Corridors.

Guidelines should meet or exceed national standards for water quality, on-road and off-road greenway facility design. Should the national standards be revised in the future, the local standards should be then re-examined for any needed changes. Standards for greenway facilities should be delineated as per the LFUCG Engineering Manuals. Standards for bicycle facilities, sidewalk facilities and signage in the Roadway Manual are based on standards set by the American Association of State Highway Transportation Officials (AASHTO). In addition, the following resource materials have been used in the preparation of these Guidelines:

- Guide to the Development of Bicycle Facilities (AASHTO), FHWA or AASHTO, www.aashto.org/bookstore/abs.html
- Americans with Disabilities Act
- Manual on Uniform Traffic Control Devices (MUTCD)

- Lexington-Fayette Urban County Government Roadway Manual,
- Lexington-Fayette Urban County Government 2001 Stormwater Manual
- Lexington-Fayette Urban County Government Division of Parks and Recreation Design Standard Manual
- Andy Clarke, American Pedestrian/Bicycle Professionals, 2002 Kentucky Rails to Trails Conference, Frankfort, KY.

For more in-depth information and design development standards, the following publications are suggested:

- Greenways: A Guide to Planning, Design and Development, Authors: Charles A. Flink and Robert Searns, Published by Island Press, 1993, www.greenways.com
- Trails for the Twenty-First Century, Authors: Charles A. Flink, Robert Searns and Kristine Olka, Published by Island Press, 2001, www.greenways.com
- Manual on Uniform Traffic Control Devices (MUTCD), Published by the U.S. Department of Transportation, Washington, DC
- Mountain Bike Trails: Techniques for Design, Construction and Maintenance, Published by Bike-Centennial, Missoula, MT
- Universal Access to Outdoor Recreation: A Design Guide, Published by PLAIE, Inc., Berkeley, CA, 1993

Other useful web sites for information include:

- Rails-to-Trails Conservancy - www.railtrails.org
- National Park Service - www.nps.org
- US Department of Transportation – www.fhwa.dot.gov/environment/bikeped/

- Pedestrian and Bicycle Information Center
www.walkinginfo.org and www.bicyclinginfo.org
- Trails and Greenways Clearinghouse -
www.trailsandgreenways.org

- National Bicycle and Pedestrian Clearinghouse
www.bikefed.org/clear.htm

I.1. Conservation Greenways



Wolf Run

The development of a Conservation Greenway may include measures to improve water quality and/or water quantity. All development shall be in accordance with the approved LFUCG [Stormwater Manual](#). For the purposes of a Conservation Greenway, it is preferred that the entire floodplain (as defined by the [Stormwater Manual](#)) be included. It is recommended that there be a minimum buffer of 50 feet (100 feet preferred) from the top of stream bank. (A minimum 25-foot buffer is required by LFUCG on each side of creeks and streams). Some Conservation Greenways will include a shared use trail or walking trail. In those cases, the minimum setback from the top of a stream bank for trail construction should be 25 feet.

Refer to the Manual for explanations concerning stream bank stabilization, erosion control, vegetative planting and best management practices. The restoration of stream banks should use vegetative or bioengineering techniques as a first and second choice. Vegetation is an important component to stream bank stabilization, water quality, flood control and wildlife/aquatic habitats. Where possible, desirable plant material should remain undisturbed, invasive species be removed and native species planted. As needed, install rock check dams to enhance the natural stream meander and create deeper pools of water to provide habitat for aquatic species and improve flooding conditions.

I.2. Constructing Trails in Floodplains



Source: Pedestrian and Bicycle Information Center

Building trails within flood prone landscapes is equal part art, science and engineering. A trail should be designed to fit the natural contours of the landscape as closely as possible but still adhere to design standards. Trails should be developed in such a manner as to support and highlight the ecological features of the floodplain environment. Finally, trails should be properly engineered to withstand the rigors of frequent flooding. The only

surface materials suitable for floodplain trails will be asphalt or concrete. It is also critically important to use geotextile fabric in constructing trails. The fabric serves to keep the subbase intact, which will, in turn, support the trail surface. Hydrostatic pressure can become a problem for trails constructed in floodplains; therefore, care and attention must be given to establishing proper surface and subsurface drainage patterns.

I.3. Boardwalk Trail



Source: Pedestrian and Bicycle Information Center

Boardwalks, or wood surface trails, are typically required when crossing wetlands or poorly drained areas. While boardwalks can be considered shared use trails, the surface tends to be slippery when wet and not suited for wheeled users. Boardwalks intended for use by bikes, pedestrians, in-line skaters, etc., should be a minimum of 14 feet wide. However, boardwalk trails limited to pedestrian use can be as narrow as 8 feet. Wood surfaced trails are usually composed of sawn wooden planks or lumber that forms the top layer of a bridge, boardwalk or deck. Synthetic wood, manufactured from recycled plastics, is now available for use as a

substitute in conventional outdoor wood construction. While these products are more expensive than wood lumber, recycled plastic lumber lasts much longer, does not splinter or warp and will not discolor. The most commonly used woods for trail surfacing are exposure-and decay-resistant species, such as pine, redwood, fir, larch, cedar, hemlock and spruce. Wood is a preferred surface type for special applications because of its strength and comparative weight, its aesthetic appeal and its versatility. However, wood can be very slippery when wet.

I.4. Low Impact or Limited Facility Path



McConnell Springs

These paths are off-road facilities designed to accommodate pedestrians and are not intended for cyclists or other wheeled users. These natural surface trails typically make use of dirt, rock, soil, forest litter, mulch, and other native materials for the trail surface. Preparation varies from machine-worked surfaces to those worn only by usage. This is the most appropriate surface for ecologically sensitive areas, such as Conservation Greenways (where designated).

These pathways, often very narrow, sometimes follow strenuous routes and may limit access to all but skilled users. Some paths may permit equestrian use.

Construction of these trails mainly consists of providing positive drainage for the trail tread and should not involve extensive removal of existing vegetation. These trails vary in width from 3 feet to 6 feet, and vertical clearance should be maintained at 9 feet (12 feet when equestrian use is allowed).

I.5. Shared Use Trail -Natural Surfaces



Proposed Brighton West Rail Trail

The off-road shared use trail designed with natural surface materials is intended to accommodate a variety of users, including walkers, joggers, bicyclists, equestrians and others. These pathways are intended for use outside of floodplains and on a grade of less than 5 percent longitudinal and 2 percent cross slope.

Materials that can be used to surface a trail include natural materials (see I.4, Low Impact or Limited Facility Path), soil cement, graded aggregate stone, granular stone, and shredded wood fiber. The soft surface materials are compatible with the natural environment; however, they do not always accommodate certain users, such as roller-bladers and disabled persons. Soft surfaced trails are preferred by some runners, mountain bicyclists and equestrians. While less expensive to install, unpaved trails typically have higher maintenance costs than hard surface trails, and require more frequent repairs. Careful consideration should be given to the amount of traffic the specific trail will generate, as these surfaces tend to deteriorate with excessive use.

Soil cement will support most user groups, though bicyclists and horseback riders should have only restricted use. Soil cement surfaces last longer if installed on top of a properly prepared subgrade and subbase. Graded aggregate stone material suitable for trail surfacing includes dense graded aggregate or crushed stone. This surface will often need to be kept in place with wood or metal edging. Because it is a loose, uncompacted surface, graded aggregate stone is limited in application to flatter slopes. Granular stone includes a broad range of aggregate stone, such as limestone, sandstone, crushed rock, gravel and sand. This is one of the best surface types for greenway trails because it can be densely compacted and is compatible with the natural environment. If properly constructed, granular stone can support bicycle and handicapped accessible trail development. Shredded wood fiber is usually composed of mechanically shredded hardwood and softwood pulp, pine bark chips or nuggets, chipped wood pieces, or other by-products of tree trunks and limbs. However, shredded wood fiber decays rapidly and must be installed on flat subgrades.

I.6. Shared Use Trail – Hard Surfaces



Squires Road Trail

Typical pavement design for hard surface, off-road, shared use trails should be based upon the specific loading and soil conditions for each project. These trails, typically composed of asphalt or concrete, should be designed to withstand the loading requirements of occasional maintenance and emergency vehicles. In areas prone to frequent flooding, it is recommended that concrete be used for its excellent durability.

One important concern for asphalt shared use trails is the deterioration of trail edges. Installation of a geotextile fabric beneath a layer of aggregate base course can help to maintain the edge of a trail. It is also important to provide a 2-foot-wide graded shoulder to prevent trail edges from crumbling. Refer to the LFUCG [Roadway Design Manual](#) for specifications on the thickness of shared use paths.

Currently, the minimum width for two-directional trails is 10 feet, however, 12 foot widths are

preferred where heavy traffic is expected. Centerline stripes should be considered for paths that generate substantial amounts of pedestrian traffic. Possible conflicts between user groups must be considered during the design phase, as cyclists often travel at a faster speed than other users.

Bituminous asphalt is a hard surface material that is popular for a variety of trails. It is composed of asphalt cement and graded aggregate stone, and is a flexible pavement that can be installed on virtually any slope.

Concrete surfaces are capable of withstanding most powerful environmental forces. They hold up well against the erosive action of water, root intrusion and subgrade deficiencies, such as soft soils. Most often, concrete is used for intensive urban applications. Of all surface types, it is the strongest and has the lowest maintenance requirement if it is properly installed.

I.7. Clear Zone



Huckleberry Trail in Virginia

A Clear Zone refers to the amount of space adjacent to a trail that is free from obstruction. This includes horizontal and vertical clearance. The amount of clearing required will depend on the type of trail being developed: low impact trails require little or no vegetation removal, while shared use

trails may require significantly more. The clear zone along trails should be a minimum of 3 feet horizontal and 10 feet vertical (12 feet for equestrian use). Refer to LFUCG [Roadway Design Manual](#) for minimum clearing distances from solid objects for on-road facilities.

I.8. Proximity and Buffers



Masterson Station Subdivision

A positive relationship can be established between publicly accessible greenways and adjacent private property. For greenways with publicly accessible trails, a minimum 50-foot (100-foot preferred) corridor should be established. This should allow enough room for the trail and any buffering or screening from surrounding private property. Trails should be located away from property lines to the greatest extent possible, and no closer than 10 feet. Buffering should be considered along greenways where there is a need for separation between the trail and adjacent properties. Separation may be necessary because of safety, privacy, aesthetics or natural resource protection. For example, in residential neighborhoods, a visual buffer provides privacy to homeowners; in rural areas, a buffer is used to separate trail users from active farming

operations. A buffer could also be considered as transitional space, such as the riparian zone between a trail and a stream, or between a trail and an active railroad or busy street.

The width of a mid-block access to a greenway depends on the intended use: if the access is for local neighborhood use, then a standard sidewalk located in a 20 foot easement should suffice; if the access shall be used by maintenance crews or in a commercial district, then the width will have to be larger. Other considerations involve signage, ADA accessibility and side yard setbacks.

For trails or paths adjacent to a stream, a minimum setback from the top of a stream bank to the trail should be 25 feet.

I.9. Sidewalk



Source: Pedestrian and Bicycle Information Center

Sidewalks are a critical component of the Lexington-Fayette County on-road Greenway System. They not only encourage walking, but they also improve the safety of pedestrians. An individual's decision to walk is as much a factor of the perceived quality of the experience as it is convenience. Pedestrian facilities should be designed with the following factors in mind:

Protection from Traffic

High volume and/or high speed (>35 mph) motor vehicle traffic creates dangerous and uncomfortable conditions for pedestrians. Physical (and perceptual) separation can be achieved in several ways, or a combination of methods, such as a grassy planting strip with trees, a raised planter, bike lanes, or on-street parallel parking.

Streetscape

Streetscape design is essential for a high quality pedestrian environment. Paving, street trees, lighting, benches, building facades, and scale are a

few elements of the streetscape that contribute to a pleasurable walking experience. Corridors should be designed for walking in safe and enjoyable surroundings.

Pedestrian-Scaled Design

Signage should be designed for clear visibility by pedestrians. Street lighting should likewise be scaled to the level of the pedestrian, instead of providing light poles that are more appropriate on high-speed roadways. Pedestrian scale also refers to the height and width ratio of buildings and trees to the sidewalk and street.

Pedestrian facilities are often discontinuous, particularly when private developers are not encouraged to link on-site pedestrian facilities to adjacent developments and nearby sidewalks or street corners. New development should be designed to encourage pedestrian access from nearby streets. Existing gaps in the system should

be placed on a prioritized list for new sidewalk construction.

Clearances

Vertical clearance above sidewalks for landscaping, trees, signs, awnings and similar obstructions should be at least 10 feet. The vertical clearance for building overhangs that cover the majority of the sidewalk should be 12 feet. Horizontal clearance needs to be a minimum of 3 feet for shrubs and other stationary obstacles. Large shrubs should be discouraged to avoid a fear of the unknown.

Conformance with National Standards

Sidewalk design should be consistent with Americans with Disabilities Act requirements and/or ANSI requirements. Specific guidance is provided by the Architectural and Transportation Barriers Compliance Board's ADA [Accessibility Guidelines](#).

Sidewalk Obstacles

Street furniture and utility poles create obstacles to pedestrian travel when located directly on the sidewalk. At a minimum, there should be 36" of sidewalk clearance to allow wheelchairs to pass. Where possible, utilities should be relocated so as not to block the sidewalk. Benches should not be sited directly on the sidewalk, but should be set back at least 3 feet

The design of new intersections or re-design of existing intersections presents an opportunity to improve pedestrian circulation. In general, the designer should consider the impact on sight distance for all features located in the vicinity of roadway intersections.

Sidewalk Pavement Design

Sidewalks and roadside pathways should be constructed of a solid surface designed to withstand adequate load requirements. Depth of pavement should consider site specific soil conditions, but in no case should it be less than 4½ inches. Brick and concrete pavers are popular materials for more decorative sidewalks. The use of stylized surfaces is encouraged, however, they must be installed properly or they will deteriorate over time.

Sidewalk Width and Setback Guidelines

Sidewalks should accommodate anticipated volumes based on adjacent land uses, and should, at a minimum, allow two adults to walk abreast with

ease. It is important to note that there are some areas that warrant wider sidewalks than the minimum. For example, sidewalks in and around local universities and colleges must accommodate a much higher volume of pedestrians, and therefore warrant additional width. The recommendations below are based upon standards used by other pedestrian-friendly communities in the United States.

By following the recommendations below, Lexington-Fayette County can ensure that basic needs of pedestrians are addressed. In existing residential and commercial areas that lack sidewalks, new sidewalk construction (independent of new development) should occur first in locations that demonstrate the most need. Note that the current [Subdivision Regulations](#) require a 4-foot minimum width for sidewalks.

Sidewalks on Local Streets in Residential Areas

Five-foot-wide sidewalks are recommended on both sides of the street, with a 5- to 7-foot-wide planting strip. The planting strip may need to be slightly wider to accommodate the roots of street trees, if they are included in the design.

Sidewalks on Collector Streets in Residential and Commercial Areas

Five-foot-wide sidewalks are recommended on both sides of the street. A 5.5-foot-wide planting strip is recommended for residential areas, and a 10.5-foot strip is recommended for commercial areas.

Sidewalks on Arterial Streets in Residential and Commercial Areas

A minimum of six-foot-wide sidewalks is recommended on both sides of the street, with 10-foot-wide planting strips.

Sidewalks on Streets within 2000' of Schools

Sidewalk width and setback should be based on the specific roadway type as described above. For all roadway types, however, sidewalks should be installed on both sides of the road, and should include well-marked crosswalks and school crossing signs.

Sidewalks on Streets with No Curb and Gutter

The setback requirements described above are based on roadway cross sections that include curb and gutter. Sidewalks located immediately adjacent to pavement with no curb and gutter are not

recommended. However, if sidewalks are to be constructed, then a much greater setback from the pavement is required, depending on roadway conditions. Engineers should consult the AASHTO [Policy on Geometric Design of Highways and Streets](#) for more specific guidelines.

Sidewalks in Rural Areas

In most rural areas, the low volume of pedestrians does not warrant sidewalk construction. In most cases, 4 to 6-foot-wide paved shoulders can provide an adequate area for pedestrians to walk on rural roadways, while also serving the needs of bicyclists.



Source Pedestrian and Bicycle Information Center

Pedestrian Crosswalk with striping, signage, bump and median

I.10. Wide Curb Lane



Source Pedestrian and Bicycle Information Center

There are three types of on-road bicycle facilities: wide curb lanes, paved shoulders, and bike lanes. Refer to the LFUCG [Roadway Design Manual](#) and AASHTO's [Guide to the Development of Bicycle Facilities](#) for details.

Wide curb lanes, or outside lanes, are wider than the standard 12-foot travel lane and can provide more space for cyclists and easier passing for motorists. Under most conditions, automobiles and bicycles can coexist in a 14-foot-wide curb lane, without the need for the motorist to move into the next adjacent lane.

Location and Width

Wide curb lanes best accommodate advanced cyclists, as these riders are more comfortable operating directly in traffic. The wide curb lane is always the furthest right-hand lane, and should optimally be 14-16 feet wide, not including the gutter pan, (consistent with the LFUCG [Roadway Design Manual](#)). Wide curb lanes are not required to have curb and gutter. A width greater than 16' is not recommended.

In order to achieve the extra space needed for a 14' wide outside lane, the roadway may either be physically widened or re-striped to reduce the lane width of inner lanes and increase the width of outer lanes. Re-striping proposals should be reviewed by

LFUCG transportation engineers to ensure adequate safety for the motorists, as well as bicyclists.

Signage

There is no special “wide curb lane” sign, however, on high volume urban arterials, LFUCG may choose to install “Share the Road” warning signs (standard bicycle warning plate with a subplate stating “SHARE THE ROAD”).

Intersection Design

As wide curb lanes approach intersections with turning lanes, the 14' wide lane should continue through the intersection as the outside through-lane.

Design Issues

Acceptance:: Bicycle programs in numerous communities have found that less experienced bicyclists seldom see a difference when wide curb lanes are provided. Therefore, if the desired outcome is greater numbers of bicyclists or a visible “Pro Bicycle” statement, this option will not satisfy the need.

Traffic speeds: Wider curb travel lanes may tend to increase motorist speeds. Whether a marginal increase in speeds is important in a particular situation should be a subject for analysis.

I.11. Paved Shoulder



Winchester Road

The second type of on-road facility is paved shoulders, which are used along rural roads and some urban streets such as Tates Creek Road and Richmond Road. Paved shoulders are not only an excellent way to accommodate the motoring public, they are also beneficial to bicyclists as well. Paved shoulders have the added advantage of eliminating problems caused when the pavement edge begins to deteriorate, thus extending the life of the road surface and requiring less maintenance. Paved shoulders also provide a pull-off for motorists with car trouble.

Width

Shoulders should be a minimum of 4 feet wide to accommodate cyclists, depending upon the speed and volume of motor vehicle traffic (consistent with LFUCG [Roadway Design Manual](#)). Paved shoulders for bicycles can be designed according to typical roadway cross sections for bicycle lanes, with the exception that no pavement decals or bicycle lane signage is used.

Although 4 feet of width is preferable, certainly any additional shoulder width is preferable to none at all. Shoulders that are 2-3 feet wide can improve conditions and are recommended in cases where 4-foot widths cannot be achieved. “Share the Road” signs would be acceptable in these locations, as they would serve to warn motorists of the likely presence of bicyclists.

As with bicycle lanes, paved shoulders should have the same pavement thickness and subbase as the adjacent roadway, and should be regularly swept and kept free of potholes.

Signage

Paved shoulders can be designated as bikeways by erecting standard bicycle route warning signs. As described above, these “Share the Road” signs may be installed on roads with paved shoulders that are less than 4 feet in width.

I.12. Bicycle Lane



Source: Pedestrian and Bicycle Information Center

The third type of on-road bicycle facility is a bike lane. Design of bicycle lanes should conform to the standards found in the LFUCG [Roadway Design Manual](#). They should not be separated from other motor vehicle lanes by curbs, parking lanes, or other obstructions. General standards for width, striping, and intersections are provided below.

Location and Use

Bicycle lanes serve the needs of experienced and inexperienced bicyclists in urban and suburban areas, providing them with their own travel lane. Bicycle lanes are always located on both sides of the road (except when they are constructed on one-way streets). By this design, cyclists are encouraged to follow the rules of the road, which require them to travel in the same direction as adjacent motor vehicle traffic. During the repair and reconstruction of roads, consideration should be given to the installation of bicycle lane facilities as designated in the [Greenway Master Plan](#) and [2025 Transportation Plan](#). Additionally, collector roads (existing and proposed) should be considered for bike lane facilities.

Width

The minimum width of bike lanes should be 4 feet, exclusive of the gutter pan. For roads with parallel

parking, bike lanes should be a minimum of 5 feet wide, and should be installed adjacent to the motor vehicle lanes, rather than between the parking lane and the curb.

Signage

The MUTCD specifies standard signage for bicycle lanes.

Striping

A bicycle lane stripe should be a solid, six inch wide white line. Care should be taken to use pavement striping that is skid resistant. Bicycle-shaped pavement symbols and directional arrows should be placed in the bicycle lane to clarify its use. Pavement letters that spell “BIKE ONLY” are also highly recommended. Symbols should be installed at regular intervals, immediately after intersections, and at areas where bicycle lanes begin.

Bike lane striping at intersections is challenging. Traffic has a tendency to mix at intersections: motorists who are turning right must cross paths with cyclists who wish to continue straight, and cyclists who wish to turn left must cross into left-hand turn lanes. Several intersection striping patterns are provided by AASHTO’s [Guide for the Development of Bicycle Facilities](#) and the MUTCD.

I.13. Trail and Trailhead Amenities



Bike Hitch Rack Downtown Lexington

One component of greenway facility design will be the installation of amenities, such as bike racks, benches, trash receptacles, landscaping, bollards, water fountains and signage. All trailheads should have parking, restrooms and kiosks. Some trailheads will need to be designed to accommodate special events or regional tourism. Trails with equestrian use will need additional space for unloading and parking horse trailers, tie posts and water troughs. Users of water trails will need adequate space to unload kayaks and canoes at a distance near to the water.

All amenities should be chosen according to the specific needs of the site; and, where appropriate, should be compatible in style to the surrounding elements. An individual trail may have a particular "theme", however for the majority of time, the details for amenities should be uniform throughout the greenway system. Amenities should also be chosen for their ease of installation, vandal resistance and low maintenance costs.

Bike Racks

It is important to choose a bicycle rack design that is simple to operate and allows for a variety of lock types. Racks should be located within 50 feet of building entrances. Racks should be installed in a public area within easy viewing distance from a main pedestrian walkway, usually on a wide sidewalk with five or more feet of clear sidewalk space remaining (a minimum of 24" clear space from a parallel wall, and 30" from a perpendicular wall).

Racks are placed to avoid conflicts with pedestrians. They are usually installed near the curb and at a reasonable distance from crosswalks. Racks should be installed at bus stops, but must not interfere with boarding or loading patterns. Lexington Transit buses already have installed racks on their buses to facilitate bike-on-transit travel.

Trash Containers

Trash containers are necessary at trailheads and staging areas. They can be attractive as well as functional, and should be selected based on the amount of trash expected, overall maintenance

program of the trail, and types of users. Trash cans need to be accessible to both trail users and maintenance personnel. At a minimum, containers should be located at each entranceway. Trash cans are not recommended along the trail. A policy of 'bring it in, take it out' should be adopted. The location of additional trash cans will depend upon the location of concessions, facilities adjacent to the trail and areas where trail users tend to congregate.

Benches

Benches along trails allow users to rest, congregate, and enjoy the view or activities. Trail benches should comfortably accommodate the average adult. They should be located at the primary and

secondary entrances to the trail, and at regular intervals along the trail. Benches should be set back three feet from the trail edge.

Signage

Necessary signage shall be provided on all trails, prior to opening, as per AASHTO and LFUCG standards. Directional signage instructs trail users as to the location of trails, intersections, trailheads and points of interest. "Rules of the Trail" is a sign listing the rules of trail use, and these need to be posted at trail access points. Interpretive signage educates trail users about a particular site or feature that they encounter along the way.



Bike Rack and Locker

I.14. Roadway Crossings



Source: Pedestrian and Bicycle Information Center

The intersection of trails/sidewalks and roadways is one particular area of concern in the greenway system development. On heavily traveled roadways, trails and sidewalks should be separated from the vehicular traffic with an overpass or underpass, where feasible.

There are two common types of trail/sidewalk and roadway conflicts: at roadway intersections and at mid-block crossings. Safety is of utmost importance when designing roadway crossings. Considerations for trail/sidewalk crossings of roads include the following:

- Use MUTCD sign standards to clearly mark the trail and road.
- Design the crossing so that trail/sidewalk users are visible and predictable to the vehicular traffic (and vice versa).
- Design with consistency throughout the greenway system.
- Design intersection and mid-block trail/sidewalks to cross at a curb cut, be at a 90-degree angle, and with no compound grade changes or curves. It is best to raise the

roadway to the level of the trail so that the trail user doesn't have to contend with grade changes at the intersection.

- Catch stormwater before it crosses the trail/sidewalk to avoid slick conditions for cyclists and pedestrians.
- Stripe the pavement at intersections to indicate the crosswalk. At mid-block crossings, (depending upon the volume of traffic) striping the trail crossing may also be advisable.
- Design other traffic calming devices, such as pavement texture changes, a median, bump-out or signalized light where necessary for safety purposes.
- Include signage that identifies the greenway, since intersections are also access points.
- Use bollards or a Y-shaped planting median on a trail to keep unwanted vehicles off of the trail.

Mid-block crossings can be the greenway corridor itself, or an access easement to the greenway. The spacing distance between mid-block access easements is dependent upon several factors, such

as grade, adjacent land use, and local regulations for maximum block length. If there is a “T” intersection within the block, it is preferred that the access be located across from the intersection for maximum exposure and use. Width of the access depends on the intended use: if it is for local

neighborhood access, then a standard sidewalk in a 20-foot easement should suffice; if the access will be used by maintenance crews, or in a commercial district, then the width should be larger. Other considerations involve signage, accessibility and distance of the sidewalk to adjacent homes.



Source: Pedestrian and Bicycle Information Center

I.15. Native Plant Species



Reforest the Bluegrass

There are a number of ways to help ensure that riparian areas provide the necessary water quality and quantity protection.. First and foremost is to retain as much of the area as possible in a naturally vegetated, undisturbed condition, especially the portion of the riparian area that is closer to the adjacent stream or creek. In most situations, "naturally vegetated" means native forest cover. Streamside forest vegetation, whether living, decaying or dead, on the ground or fallen or extending into the water, should be left in place wherever possible to maximize its detention capability and allow plenty of time for the

breakdown of pollutants by plants and microorganisms. Excessive "tidying up" of riparian areas by leaf raking, brush clearing, removing fallen logs or other removal of plant material from the forest floor and/or streambank can significantly reduce detention time and the opportunity for the riparian area's living filter to beneficially interact with and attenuate water-borne pollutants.

In order to insure proper native and non invasive species the attached table provide the recommended native and non invasive species.

**NATIVE PLANT SPECIES SUITABLE FOR STREAMBANKS
AND RIPARIAN BUFFERS IN CENTRAL KENTUCKY**

Herbaceous Ground Covers:		
Common Name	Scientific Name	Shade/Sun
River Oats	<i>Chasmanthium latifolia</i>	shade
Indian Grass	<i>Sorghastum nutans</i>	sun
Switch Grass	<i>Panicum virgatum</i>	sun
Redtop	<i>Agrostis alba</i>	sun
Deertongue	<i>Panicum clandestinum</i>	shade
Broomsedge	<i>Andropogon virginicus</i>	sun
Big Blue Stem	<i>Andropogon gerardii</i>	sun
Frank's Sedge	<i>Carex frankii</i>	sun
Gray's Sedge	<i>Carex grayii</i>	shade
Soft Rush	<i>Juncus effusus</i>	sun
Flat Sedge	<i>Cyperus strigosus</i>	sun
Lady Fern	<i>Athyrium felix-femina</i>	shade
Sensitive Fern	<i>Onoclea sensibilis</i>	shade
Cinnamon Fern	<i>Osmunda cinnamomea</i>	shade
Common Boneset	<i>Eupatorium perfoliatum</i>	sun
Golden Ragwort	<i>Senecio aureus</i>	shade
Wrinkled Goldenrod	<i>Solidago rugosa</i>	sun
Tall Goldenrod	<i>Solidago gigantea</i>	sun
Beard Tongue	<i>Penstemon hirsutus</i>	shade
Monkey Flower	<i>Mimulus ringens</i>	shade
Cardinal Flower	<i>Lobelia cardinalis</i>	shade
Great Blue Lobelia	<i>Lobelia silphilitica</i>	shade

**NATIVE PLANT SPECIES SUITABLE FOR STREAMBANKS
AND RIPARIAN BUFFERS IN CENTRAL KENTUCKY**

Vines and Shrubs:		
Common Name	Scientific Name	Shade/Sun
Cross Vine	<i>Bigonia capreolata</i>	shade
Trumpet Creeper	<i>Campsis radicans</i>	sun
Climbing Hydrangea	<i>Decumaria barbara</i>	shade
Giant Cane	<i>Arundinaria gigantea</i>	sun
Buttonbush	<i>Cephalanthus occidentalis</i>	sun
Meadowsweet	<i>Spirea alba</i>	sun
Sweetspire	<i>Itea virginica</i>	shade
Spicebush	<i>Lindera benzoin</i>	shade
Paw-paw	<i>Asimina triloba</i>	shade
Arrowwood	<i>Viburnum dentatum</i>	shade
Nannyberry	<i>Viburnum lentago</i>	sun
Swamp Haw	<i>Viburnum nudum</i>	shade
Ninebark	<i>Physocarpus opolifolius</i>	sun
Hazelnut	<i>Corylus americana</i>	sun
Possum Haw	<i>Ilex decidua</i>	sun
Winterberry	<i>Ilex verticillata</i>	shade
Chokeberry	<i>Aronia arbutifolia</i>	sun
Elderberry	<i>Sambucus canadensis</i>	sun
Juneberry	<i>Amelanchier arborea</i>	shade
Mountain Camelia	<i>Stewartia ovata</i>	shade
Sweetbells	<i>Leucothe racemosa</i>	shade
Smooth Azalea	<i>Rhododendron arborescens</i>	shade
Silky Dogwood	<i>Cornus amomum</i>	sun
Redosier Dogwood	<i>Cornus stolonifera</i>	shade
Rough-leaf Dogwood	<i>Cornus drummondii</i>	shade
Pagoda Dogwood	<i>Cornus alternifolia</i>	shade
Smooth Alder	<i>Alnus serrulata</i>	sun
Sandbar Willow	<i>Salix interior</i>	sun
Silky Willow	<i>Salix sericea</i>	sun
Dwarf Willow	<i>Salix humilis</i> var. <i>macrophylla</i>	sun
Pussy Willow	<i>Salix discolor</i>	sun
Streamco Willow	<i>Salix purpurea</i>	sun
Bankers Willow	<i>Salix x cotteti</i>	sun
Heart-leaf Willow	<i>Salix rigida</i>	sun

**NATIVE PLANT SPECIES SUITABLE FOR STREAMBANKS
AND RIPARIAN BUFFERS IN CENTRAL KENTUCKY**

Trees:	
Common Name	Scientific Name
Black Willow	<i>Salix nigra</i>
Boxelder	<i>Acer negundo</i>
Red Maple	<i>Acer rubrum</i>
Silver Maple	<i>Acer saccharinum</i>
Green Ash	<i>Fraxinus pennsylvanica</i>
White Ash	<i>Fraxinus americana</i>
Red Elm	<i>Ulmus rubra</i>
Silverbell	<i>Halesia carolina</i>
Persimmon	<i>Diospyros virginiana</i>
River Birch	<i>Betula nigra</i>
Black Gum	<i>Nyssa sylvatica</i>
Hackberry	<i>Celtis occidentalis</i>
Cottonwood	<i>Populus deltoides</i>
Sweet Gum	<i>Liquidambar styraciflua</i>
Tulip Polar	<i>Liriodendron tulipifera</i>
Sycamore	<i>Plantanus occidentalis</i>
American Beech	<i>Fagus grandiflora</i>
Ironwood	<i>Carpinus caroliniana</i>
Yellow Buckeye	<i>Aesculus octandra</i>
Shellbark Hickory	<i>Carya lacinosa</i>
Shagbark Hickory	<i>Carya ovata</i>
Pecan	<i>Carya illinoensis</i>
Black Walnut	<i>Juglans nigra</i>
Bur Oak	<i>Quercus macrocarpa</i>
Pin Oak	<i>Quercus palustris</i>
Swamp Oak	<i>Quercus bicolor</i>
Swamp Chestnut Oak	<i>Quercus michauxii</i>

**NATIVE HERBACEOUS SPECIES SUITABLE FOR WET PONDS
AND CONSTRUCTED WETLANDS IN CENTRAL KENTUCKY**

Common Name	Scientific Name	Water Depth
Barnyard grass	<i>Echinochloa crusgalli</i>	transitional
Switch Grass	<i>Panicum virgatum</i>	transitional
Swamp Milkweed	<i>Asclepias incarnata</i>	transitional
Giant Cane	<i>Arundinaria gigantea</i>	transitional
Jewelweed	<i>Impatiens capensis</i>	transitional
River oats	<i>Chasmanthium latifolia</i>	transitional
Deertongue	<i>Panicum clandestinum</i>	transitional
Boneset	<i>Eupatorium perfoliatum</i>	transitional
Sedges	<i>Carex</i> spp.	shallow
Soft rush	<i>Juncus effusus</i>	shallow
Rice cutgrass	<i>Leersia oryzoides</i>	shallow
Flat sedges	<i>Cyperus</i> spp.	shallow
Blue iris	<i>Iris virginicus</i>	shallow
Panic grass	<i>Panicum agrostoides</i>	shallow
Wool grass	<i>Scirpus cyperinus</i>	shallow
Pink smartweed	<i>Polygonum pennsylvanicum</i>	shallow
Green bulrush	<i>Scirpus atrovirens</i>	mid
Pickerelweed	<i>Pontederia cordata</i>	mid
Duck potato	<i>Sagittaria latifolia</i>	mid
Arrow arum	<i>Peltandra virginica</i>	mid
Bur-reed	<i>Sparganium eurycarpum</i>	mid
Wild rice	<i>Zizania aquatica</i>	mid
Spike rushes	<i>Eleocharis</i> spp.	mid
Water plantain	<i>Alisma subcordatum</i>	mid
Three square sedge	<i>Scirpus americanus</i>	mid
Yellow water crowfoot	<i>Ranunculus flabellaris</i>	deep
White water buttercup	<i>Ranunculus longirostris</i>	deep
Water lotus	<i>Nelumbo lutea</i>	deep
Spaderdock	<i>Nuphar luteum</i>	deep
White water lily	<i>Nymphaea tuberosa</i>	deep
Duckweed	<i>Lemna</i> spp.	floating

Note: transitional = seasonally flooded edge; shallow = 0 – 6 inches, semi-flooded pool; mid = 6 – 20 inches, permanent pool; deep = 20 – 60 inches, permanent pool; floating = non rooted